



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/576,070

12/20/2006

Friedrich Boecking

R.306610

4804

2119 7590 05/13/2008
RONALD E. GREIGG
GREIGG & GREIGG P.L.L.C.
1423 POWHATAN STREET, UNIT ONE
ALEXANDRIA, VA 22314

EXAMINER

COLEMAN, KEITH A

ART UNIT

PAPER NUMBER

3747

MAIL DATE

DELIVERY MODE

05/13/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/576,070	Applicant(s) BOECKING, FRIEDRICH	
	Examiner KEITH COLEMAN	Art Unit 3747	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 February 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 11-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 11-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 11-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsumura et al. (US Patent No. 4,381,077) in view of Schechter et al. (US Patent No. 4,899,714).

With regards to claim 11, Tsumura et al. discloses a hydraulic booster assembly (See Figures 1 and 2) connected downstream of the actuator (38, via 14, Col. 3, Line 8), and first and second control **chambers** (not shown, air intake via conduit 28, and fuel tank via conduit 26, Col. 2, Lines 60-65) associated with the injection valve member for actuating the valve member (60, 22), the improvement wherein the hydraulic booster assembly actuated by the actuator (38) comprises **a first booster chamber (68) hydraulically connected to second control chamber (26) that actuates the outer needle part (22)~ and a second booster chamber (upper chamber of 62 separated by ledge 72, See Figure 1) hydraulically connected to the first control chamber (28) that actuates the inner needle part (60). The first and second control chambers actuate the booster chambers. (See Col. 4, Lines 29-40)** a nozzle body (18, Col. 3, Line 50), **a multi-part** injection valve (60,22) member having **an inner needle part and an outer needle part** (i.e. inner and outer needle parts) received in the nozzle body (18, Col. 3, Line 50), and an actuator (38, via 14, Col. 3, Line 8), and the injector (10, Col. 2, Line 48, See Figure 1) having an injector body (16, Col. 2, Line 48, See Figure 1). Tsumura et al. does not positively disclose a fuel injector for a common rail injection system for injecting fuel into a combustion chamber of an internal combustion engine. Schechter et al. discloses a fuel injector (10, Col. 2, Lines 60-62,

Art Unit: 3747

50, Col. 4, Line 1) for a common rail injection system (58, Col. 3, Line 68) for injecting fuel into a combustion chamber of an internal combustion engine (Col. 1, Lines 8-10). As to a piezoelectric actuator, since Schechter et al. explicitly states that the solenoids can be replaced by piezoelectric actuators (Col. 2, Line 40) or other actuating devices and also discloses an injector (10) having an injector body (12, Col. 2, Lines 60-61), a nozzle body (22, Col. 2, Line 67), an injection valve member (18, Col. 2, Line 65) embodied in multiple parts in the nozzle body (22, See Figure 1) with an actuator (near 42, See Figure 3, Col. 3, Lines 23-29), it would have been obvious to a person of ordinary skill in the art at the time the invention was made to substitute the mechanical actuator of Tsumura et al. with a piezoelectric actuator in view of the teaching to Schechter et al., in order to control the fuel and air entering the injector (Col. 2, Lines 38-42 from Schechter et al.).

With regards to claim 19, Tsumura et al. discloses wherein the actuator (38, via 14, Col. 3, Line 8) is integrated with the fuel inlet (See Figure 1). Using broadest reasonable interpretation, "integrate" is defined as to bring together or incorporate (parts) into a whole, and the actuator (38) is united with the fuel passage (i.e. fuel passage 30 is to the right of actuator 38, Col. 2, Line 59, See Figure 1) into a whole apparatus (16, See Figures 1 and 2).

With regards to claim 12, Tsumura et al. discloses wherein the first booster chamber (68, Col. 3, Lines 35-36) communicates with a second control chamber (i.e. air

intake, not shown, via air inlet 28 and conduit 34, Col. 2, Lines 60-65) for the outer needle part (22, Col. 2, Line 52) via a conduit (34, See Figures 1 and 2), and the second booster chamber (upper chamber of 62, Col. 3, Line 31, See Figure 1) communicates with a first control chamber (i.e. fuel tank, via fuel inlet 26 and passage 64 and 66, Col. 3, Lines 30-35) for the inner needle part (60, Col. 3, Line 26, See Figure 1).

With regards to claim 13, Tsumura et al. discloses a pressure chamber (lower part of chamber 62 separated by ledge 72, Col. 3, Line 43) embodied between the needle parts (60,22) guided one inside the other (60, 22, See Figures 1 and 2), of the multi-part injection valve member, which pressure chamber (lower part of 62) can be filled from a nozzle chamber (68) surrounding the multi-part injection valve member (via 68 and passage 64 and 66, Col. 3, Lines 30-35).

With regards to claim 14, Tsumura et al. discloses a first (top part of 22, See Figure 2) and a second pressure step (bottom of ledge 72, See Figure 2) on the outer needle part (22, ledge 72 is integrated into outer needle part 22) and acting in the opening direction (See Figures 1 and 2).

With regards to claim 15, Tsumura et al. discloses a first (top part of 22, See Figure 2) and a second pressure step (bottom of ledge 72, See Figure 2) on the outer needle part (22, ledge 72 is integrated into outer needle part 22) and acting in the opening direction, the second pressure step (22, ledge 72 is integrated into outer needle

part 22) being embodied in said pressure chamber (lower section of 62 separated by ledge 72, See Figure 1).

With regards to claim 16, Tsumura et al. discloses all the limitations of the claimed subject matter, including a pressure step (bottom area of top 74, Col. 3, Line 43, See Figure 1) embodied on the inner needle part (60), on the end thereof toward the combustion chamber (88, Col. 3, Lines 66-67), except the hydraulic area of said pressure step on the inner needle part being operative in the opening direction of the inner needle part being less than the hydraulically operative areas of the first and second pressure steps of the outer needle part. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the hydraulic areas of Tsumura et al. with the hydraulic area of said pressure step on the inner needle part being operative in the opening direction of the inner needle part being less than the hydraulically operative areas of the first and second pressure steps of the outer needle part because the modification is invariably a change in size. See MPEP 2144.04. In *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. CIR. 1984), cert. Denied, 469 U.S. 830, 225 USPQ 232 (1984), the Federal Circuit held that, where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device.

With regards to claim 17, Tsumura et al. discloses all the limitations of the claimed subject matter except wherein the hydraulically operative areas, in the opening direction, of the pressure steps of the outer needle part exceed the hydraulically operative area on the end toward the combustion chamber of the inner needle part. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the hydraulic areas of Tsumura et al. with wherein the hydraulically operative areas, in the opening direction, of the pressure steps of the outer needle part exceed the hydraulically operative area on the end toward the combustion chamber of the inner needle part because the modification is invariably a change in size. See MPEP 2144.04. In *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. CIR. 1984), cert. Denied, 469 U.S. 830, 225 USPQ 232 (1984), the Federal Circuit held that, where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device.

With regards to claim 18, Tsumura et al. discloses a first seat formed on the outer needle part (the bottom portion of 22) and a second seat formed on the inner needle part (84, the bottom portion of 60, Col. 3, Line 59, See Figure 1), which seats cooperate with a wall of the nozzle body (18, See Figures 1 and 2).

With regards to claim 20, Tsumura et al. discloses a first injection openings (80, Col. 3, Line 51, See Figure 1, from Figure 1 there are two openings, Left opening being the first opening) that can be opened or closed by the first seat (when 60 and/or 22 is opened or closed position, See Figures 1 and 2) and second injection openings (80, Col. 3, Line 51, See Figure 1, from Figure 1 there are two openings, Right opening being the second opening) that can be opened or closed by the second seat (when 60 and/or 22 is opened or closed, See Figures 1 and 2), said first and second injection openings (80) being embodied on the nozzle body (18) and opening in the direction of the combustion chamber (88, See Figures 1 and 2).

5. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsumura et al. (US Patent No. 4,381,077) in view of Schechter et al. (US Patent No. 4,899,714) and Benson (US Patent No. 3,501,099).

With regards to claim 21, the combination of Tsumura et al. and Schechter et al. discloses all the limitations of the claimed subject matter including Tsumura et al. disclosure of a fuel injector (10) for a common rail injection system for injecting fuel into a combustion chamber of an internal combustion engine (Col. 1, Lines 5-10), the injector (10) having an injector body (10), a nozzle body (18), a multi-part injection valve member (60,22) having an inner needle part (60) and an outer needle part (22) received in the nozzle body (18), and Schechter et al. disclosure of

a piezoelectric actuator (Col. 2, Line 40) except positively disclosing a hydraulic booster assembly connected downstream of the piezoelectric actuator, and first and second control chambers associated with the injection valve member for actuating the valve member, the improvement wherein the hydraulic booster assembly actuated by the piezoelectric actuator comprises a second booster chamber acts upon a first control chamber for triggering the inner needle part, and a first booster chamber acts on a second control chamber for triggering the outer needle part.

Schechter et al. explicitly states that the solenoids can be replaced by piezoelectric actuators (Col. 2, Line 40) or other actuating devices and also discloses an injector (10) having an injector body (12, Col. 2, Lines 60-61), a nozzle body (22, Col. 2, Line 67), an injection valve member (18, Col. 2, Line 65) embodied in multiple parts in the nozzle body (22, See Figure 1) with an actuator (near 42, See Figure 3, Col. 3, Lines 23-29).

Benson discloses **a hydraulic booster assembly (See Figure 9) connected downstream of the piezoelectric actuator (242), and first (246) and second (258) control chambers associated with the injection valve member for actuating the valve member, the improvement wherein the hydraulic booster assembly actuated by the piezoelectric actuator comprises a second booster chamber (252) acts upon a first control chamber (246) for triggering the inner needle part (238), and a first booster chamber (260) acts on a second control chamber (258) for triggering the outer needle part (240).**

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the actuator of the combination of Tsumura et al. and Schechter et al. with wherein the hydraulic booster assembly actuated by the piezoelectric actuator comprises a second booster chamber acts upon a first control chamber for triggering the inner needle part, and a first booster chamber acts on a second control chamber for triggering the outer needle part in view of the teaching to Benson, in order to control the fuel and air entering the injector (Col. 2, Lines 38-42 from Schechter et al.).

Response to Arguments

Applicant's arguments filed 2/8/2008 have been fully considered but they are not persuasive.

Applicant's Arguments

Applicant argues that "To fulfill this recitation of claim 11, the "outer" part 22 of Tsumura et al would have to cover and uncover at least **one injection opening**. Otherwise, it is not a valve member." And "The outer piston 22 acts neither to close, nor to open injection openings, and in this respect is not a needle part."

Examiner's Response to Arguments

With regards to Applicant's argument that essentially "since the outer part does not cover or uncover at least one injection opening, it's not a needle part", 'valve' is

Art Unit: 3747

defined as any device for **halting** or controlling the flow of a liquid, gas, or other material through a **passage, pipe, inlet, outlet, etc.** Tsumura et al. clearly shows in Figure 2 the outer part 22 halting the flow of passages 26 and 28 and explicitly states on Col. 2, Lines 50-55 that “This premixing chamber has a **fuel inlet port 26 and an air inlet port 28**, both formed in **the nozzle body 16**, which are to be **covered and uncovered [i.e. halting the flow of a fluid]** by the reciprocating piston 22.”

Furthermore, ‘needle valve’ is defined as **a valve** in which the opening is controlled by a needlelike or **conical point** (parts 22 and 60 are conical in Figures 1 and 2) that fits into **a conical seat** (i.e. the interior seat member of 18, See Figure 2). Using broadest reasonable interpretation, it is clear that the outer portion 22 cited in Tsumura et al. is a needle part of a needle valve.

With regards to the amendments, the claimed language in claim 11 was still too broad to not overcome the prior references used in the first action. With regards to claim 21, the claimed language further included the piezo-actuator for each booster chamber; however, the patent to Benson shows multiple embodiments of using different chambers and piezo-actuators supporting the obviousness rationale and Schecter et al. disclosure of using piezo-actuators.

Thus, this action is made final.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KEITH COLEMAN whose telephone number is (571)270-3516. The examiner can normally be reached on 5:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Cronin can be reached on (571)272-4536. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 3747

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

KAC

/K. C./

Examiner, Art Unit 3747

/Stephen K. Cronin/

Supervisory Patent Examiner, Art Unit 3747